DRAFT
Automated Configuration Management System (ACMS)
Concept of Operations (CONOPS)

1. Introduction

1.1 Purpose

1.1.1 Purpose of ACMS. The purpose of the Army's Automated Configuration Management System (ACMS) is to provide the Army with a next generation engineering data management system. ACMS will enable greater access to and sharing of corporate engineering data in support of Integrated Product Teams (IPTs), reprocurement activities, engineering change processing, operations and maintenance activities, and disposal activities. The primary enhancements ACMS will provide include the following:

1.1.1.1 *Storage and Use*. Extension of the types of data stored and managed (e.g., engineering models, simulations, and other forms of intelligent engineering data).

1.1.1.2 *Rapid Retrieval*. Enhanced ability to rapidly find, retrieve, and control access to engineering data.

1.1.1.3 *Process Automation*. Automation of standard processes such as baseline and release approvals, engineering change processing, Technical Data Package (TDP) validation, and IPT support.

1.1.2 Purpose of ACMS CONOPS. The ACMS concept of operations (CONOPS) has three primary purposes. First, it is intended to translate the ACMS vision into operational terms that guide development of ACMS performance requirements . Second, the ACMS CONOPS provides developers and users with an understanding of the operational context of those requirements. The third purpose of the ACMS CONOPS is to serve as a consensus building tool among the Army Major Subordinate Commands (MSCs) as to what kinds of capabilities ACMS will have, what functions it will support, and how ACMS will be used.

1.2 Scope

1.2.1 Scope of ACMS. ACMS will be the Army's enterprise engineering data manager. The combined capabilities of ACMS will support traditional configuration management functions, management of product structures, management of engineering data and associated technical data, engineering change proposal processing, the Army's Tech Loop functions, and interfaces with legacy repository systems (notably the Joint Engineering Data Management Information and Control System (JEDMICS)), the Army's Standard Procurement System (SPS), and Contractor Integrated Technical Information Systems (CITIS). ACMS will enable managing the Army's engineering and technical data throughout the life-cycle of a system -- from program development, through production, sustainment, modification, and ultimately disposal.

1.2.2 Scope of ACMS CONOPS. The ACMS CONOPS provides an overview of the operational uses for ACMS based on guidance expressed in the Army's ACMS vision and specific goals (both restated in the following section). Specifically, ACMS will operate as a corporate data manager and provider, an interfacing mechanism both externally and within the ACMS federation of systems, and a process enabler. The ACMS CONOPS also includes descriptions of ACMS operations in support of selected business processes.

2. ACMS Vision and Goals

2.1 ACMS Vision

2.1.1 Provide Required Data. ACMS will provide the required data **when it is needed** and **in a form that**

the user can apply to accomplish the mission.

2.1.2 Required Data Contents. Required data consists of **all the engineering data necessary to completely define an item** for the intended purposes of specifying, designing, analyzing, manufacturing, maintaining, sustaining, testing, inspecting, and dispositioning that item **over its entire life span**.

2.1.3 Flexible Data Management Environment. ACMS must operate in a **diverse Army environment**, **integrate** with other MSC business processes, and **communicate** with other MSC, government and industry information management systems.

2.2 Specific ACMS Goals

2.2.1 System of Systems. ACMS will be a system of systems that is scaleable and leverages the capabilities of existing government systems where feasible, cost effective, and necessary.

2.2.2 Visible Data Changes. Any changes made to controlled engineering data or metadata that are caused or enacted by a system within ACMS will be visible to any ACMS user who is authorized to see, use, or revise the data.

2.2.3 COTS Based. ACMS will be based on COTS products.

2.2.4 Core Data and Capabilities. ACMS will provide a core set of standard, Army-wide data and capabilities. Specifically, ACMS will:

2.2.4.1 *Single Access and Control Point*. Provide a single, common means of finding, accessing, and controlling Army enterprise-level engineering data.

2.2.4.2 *Sharing of Data*. Provide for concurrent, enterprise-wide access to and sharing of engineering data in a distributed, collaborative manner (both the data and the users may be geographically dispersed).

2.2.4.3 *MIL-STD-2549 Data*. Produce and read MIL-STD-2549 data packets as a means for exchanging relationship and configuration management metadata with internal and external Product Data Management (PDM), Configuration Management (CM), authoring, Contractor Integrated Technical Information Service (CITIS), and repository systems.

2.2.4.4 *Secure Data*. Control and secure Army engineering data, yet not inhibit authorized users (to include remote users) from locating and retrieving needed data quickly and easily.

2.2.4.5 *Manage Multiple Formats*. Provide for the management of a wide variety of engineering data formats, so that contractor created data is available, usable, and no data intelligence is lost.

2.2.4.6 *Automate Engineering Data Management*. Automate Army data management functions to include data capture, storage, location, retrieval, access control, and transmittal, as well as configuration management of data, quality control of data, and system administration.

2.2.4.7 *Manage Product Structures*. Provide for establishing, storing, and controlling links (relationships) between elements of product structures (i.e., parts, components, and assemblies).

2.2.4.8 *Manage Data Representations*. Provide for establishing, storing, and controlling the associations between product structures and the engineering data that represent (describe) the elements of product structures.

2.2.4.9 *Manage Workflow*. Provide for work process definition, routing, status tracking, and performance analyses.

2.2.5 Tailorable. ACMS will be flexible and customizable in its ability to interact with other data management systems and meet the unique information needs of individual MSCs. Specifically, ACMS will provide:

2.2.5.1 *Configuring Capabilities*. System administrator-level tools for configuring ACMS to support information interchange within an Army site in accordance with each site's business processes and technical data needs, so long as the core information is provided for off-site users. These tools will permit configuring the system without needing to directly write source code or recompile unaffected software modules.

2.2.5.2 *Customization and Integration Capabilities*. Provide customization and integration tools for tailoring ACMS to extend existing functionality, add new functions, provide new methods for interacting with users, and interface with other data management systems, data authoring systems, and viewing systems.

2.2.6 Standard Interfaces. ACMS will provide standard interfaces to systems belonging to various user communities (e.g., MSC, government and industry information and process management systems). For example, this includes COTS, government standard, and command-unique workflow and technical data management systems such as the following:

2.2.6.1 Mission Applications,

2.2.6.2 Workflow Management Systems,

2.2.6.3 Configuration Management Systems,

2.2.6.4 Repository Systems,

2.2.6.5 Data Authoring Systems and their Internal Data Management Features,

2.2.6.6 Product Data Management (PDM) Systems, and

2.2.6.7 Contractor Integrated Technical Information Service (CITIS) systems.

2.2.7 Existing Infrastructures. ACMS will use existing Army communications and computing infrastructures whenever feasible and cost effective.

3. Overview of ACMS Concept

3.1 ACMS as a System of Systems

3.1.1 Federated System of Systems. ACMS is to be the principal Army system for finding, retrieving, managing, and controlling access to Army engineering and technical data. It will be a federated system of systems in the sense that all sites will share standard data and possess capabilities that are common to the whole of ACMS, while retaining the right and ability to establish site unique capabilities and data. Within the ACMS federation, any authorized user will have visibility into ACMS controlled product structures, associated engineering and technical data, and standard ACMS metadata which identifies and characterizes the engineering and technical data.

3.1.2 Corporate-Level Visibility. ACMS will be fielded into an environment where many data

management, repository, and workflow systems already exist. As such, the ACMS concept must embrace all of these related systems by interfacing with them, subsuming them, or replacing them. In some cases, ACMS will be the only data manager, product structure manager, process manager, or repository for a set of engineering and technical data. In other cases, actual storage and direct control of the data and product structure will be performed by another data management system which must interface with ACMS. In all cases, however, ACMS must be afforded visibility into Army engineering and technical data in terms of its identity, status, and form. Likewise, it must be possible for authorized users to locate and retrieve any formally controlled, digital Army engineering and technical data via ACMS.

3.1.3 Minimum Core Metadata. MIL-STD-2549, *Department of Defense Interface Standard, Configuration Management Data Interface*, defines the minimum core metadata which must be sharable within and outside the ACMS federation. The data elements describe the configuration management data needed to support the principles of configuration management specified in EIA/IS-649, *National Consensus Standard for Configuration Management*. These data elements and the relationships depicted in MIL-STD-2549 also provided the basis for exchanging rudimentary product structure information in the form of parts list and Bill of Materials (BOM) data.

3.2 Specific ACMS Roles

3.2.1 Army Engineering Data Manager

3.2.1.1 *Corporate Engineering Data Manager*. ACMS is intended to be the Army's corporate or enterprise engineering data manager. To accomplish this, ACMS will need visibility into all engineering and technical data that is formally controlled and digitally stored. As a result, systems within the ACMS federation will need to exchange metadata about this engineering and technical data. This is necessary so that the data, a corporate resource, can be widely shared. ACMS will enable authorized users to create, find, manage, retrieve, view, redline, update as a new version, save as new data, or make some other use of any piece of controlled, digitally stored Army engineering and technical data. ACMS must be able to configuration manage this data regardless of which digital data repository physically stores the data (contractor or government) or which data management system exercises direct control over the data.

3.2.1.2 *Single, Comprehensive Engineering Data Manager*. In some instances, ACMS will function as the sole data manager and repository for a collection of engineering and technical data. This includes directly providing for the physical storage and configuration management of the data, as well as the security for and controlled access to the data. The security and controlled access will include managing user authorizations, monitoring access, and providing for the check-in and check-out of data. In these cases, ACMS will be the only data manager for the data.

3.2.1.3 *Shared Engineering Data Manager*. In other instances, ACMS will share data management responsibilities with other systems. Examples of other systems include unique Product Data Management (PDM), Configuration Management (CM), and CITIS systems owned and operated by individual programs, commands, or contractors. Data management features inherent in data authoring systems are another example of cases where ACMS will need to share data management responsibilities. Under these circumstances, physical storage, configuration management, security, and access control of the data will be accomplished by a system other than ACMS. ACMS and the other data management system, however, will interface to exchange metadata (see the Minimum Core Data discussion above), so that ACMS can maintain corporate level visibility of Army engineering data.

3.2.1.4 *Engineering Repository Manager*. For Army engineering data contained in or destined for JEDMICS, ACMS will be the Army entry point for both retrieving and loading the engineering data itself and related file index data (a subset of ACMS metadata). This concept of operation ensures that ACMS and JEDMICS data remain synchronized. ACMS will also provide for the configuration management of

this data.

3.2.2 Army-Wide Engineering Data Provider. With ACMS, it will be possible for any authorized user to identify and request any piece of digitally stored and controlled Army engineering and technical data. ACMS will assist the user in identifying the desired data, locate and request the data for the user, and then present the data to the user in a usable form. The following are key implications that result from this role:

3.2.2.1 *Visibility*. As the corporate engineering data manager for the Army, ACMS will have visibility into the identity and location of all formally controlled engineering data, regardless of whether it is owned by the Army (see 3.2.2.2) or another organization (see 3.2.2.3).

3.2.2.2 *ACMS Federation's Principal Entry Point*. ACMS will be the Army's principal entry point into the Army's federated engineering data management system. This means that Army data users will access and check-out Army owned and controlled engineering data via ACMS. It also means that Army data creators will use ACMS as the principal mechanism for placing Army engineering data under formal data management control (i.e., checking in data).

3.2.2.3 *ACMS User's Entry to External Data Management Systems*. When ACMS does not have direct physical control of desired data (vaulted elsewhere), ACMS will formulate a request for the data, submit the request to the controlling system, receive the requested data or response notice, and make the result (requested data or response notice) available to the user. As a result, Army data users will be able to check-out Army engineering data via ACMS even when ACMS does not directly manage the data.

3.2.2.4 *Product Centric Data Management*. ACMS represents a shift in the Army from document centric data management to product centric data management. This change will enable users to identify desired data by navigating product structures, searching for and through part families, as well as traditional approaches to finding data via search queries on data classification attributes. Product centric data management also means that the product structure is a controlled item in addition to (or in place of) documents describing the product structure (e.g., Bill of Materials).

3.2.2.5 *Web-Based Access*. ACMS will include the ability to access ACMS controlled data via commercially available Web browsers. Users of the ACMS will be able to login to ACMS via the browser, find desired data via search queries or product structure navigation, request (check-out) and receive data for viewing or copying (as new data), and mark-up or redline viewable images.

3.2.3 Interface Provider. ACMS will be fielded into a diverse environment of legacy engineering data management systems, repository systems, authoring systems, and mission applications that need to interact with ACMS. Furthermore, as a federated system of systems, ACMS itself will need to exchange data among several site unique implementations of ACMS. As a result, the ACMS architecture will need to be open and embrace a standards oriented approach to interfacing with other systems. Specifically, the ACMS will need to have a published Application Program Interface (API). It also will need to migrate towards the configuration management data interface standard (MIL-STD-2549) as the means for defining what metadata must be exchanged among ACMS and other PDM and CM systems.

3.2.4 Army-Wide Product Structure Manager. Product structure management is a new concept for Army-wide engineering and technical data management. It signifies a move away from document centric data management philosophy to product or part centric engineering data management. ACMS will have visibility into and configuration control of the product structure of any item for which controlled, digital engineering data is maintained. Associated with the product structure, ACMS will have visibility into the identity and location of all controlled, digital data that represents the elements of product structure. Thus, users of Army controlled engineering data may find the data by navigating the relevant product structure.

Additionally, ACMS will support displaying multiple views of the product structure. For example, ACMS can present design views of the data which would show the design data associated with the product structure. Another view would be a manufacturing view. In this view, some design information would be presented, but manufacturing process descriptions and simulations also might be included. Other views are possible as well.

3.2.5 Process Enabler. ACMS is intended to be a significant enabler of various Army business processes by making engineering data widely accessible and providing workflow tools that facilitate the distribution of tasks and data, as well as the monitoring and management of the processes modeled by the workflows. Specifically, ACMS will improve the efficiency of Army IPTs, Engineering Change Proposal (ECP) processing, and reprocurement Tech Loop activities by making it much easier to find and retrieve needed engineering and technical data; by providing tools that enable users to view, mark-up, or comment on data; by allowing concurrent access to data; by distributing tasks, electronic forms, and notices of assigned tasks and data availability via pre-defined and ad hoc workflows; by supporting electronic sign-off on data or tasks; and by dynamically adjusting access as user roles change with the receipt of specific tasks.

4. ACMS Support of Weapon System and Data Life-Cycles

4.1 ACMS Support of Weapon System Life-Cycle. The envisioned scope of ACMS is to be the Army's enterprise engineering and technical data manager throughout the life-cycle of a weapon system -- from program development, through production, operation, sustainment, modification, and ultimately disposal of the system. The following paragraphs describe the role and support ACMS provides from the perspective of a weapon system's life-cycle.

4.1.1 Development

4.1.1.1 *Continuous, Concurrent, and Wide-Spread Access*. During weapon system development, ACMS is intended to be the Army's primary mechanism for maintaining continuous and concurrent visibility into the content and status of developing weapon system engineering and technical data. ACMS will be a key tool used by the Army to support the execution of the Integrated Product and Process Management (IPPM) concepts for developing weapon systems. Under the IPPM concept, IPTs will be formed from all user communities who have responsibility for, use, or support the weapon system at some point in its life-cycle. By having ready access to developing data, members of the IPT may influence the design early and avoid excessive life-cycle costs or expensive changes late in the system's development or manufacture. Examples of user communities include the following:

4.1.1.1.1 Designers and engineers who develop the system,

4.1.1.1.2 Testers who will test the weapon system,

4.1.1.1.3 Manufacturers who must build the system,

4.1.1.1.4 Program managers who must manage the system's development,

4.1.1.1.5 Trainers who will develop training courses,

4.1.1.1.6 Operational users who must use the system in the field,

4.1.1.1.7 Logisticians and maintenance personnel who must sustain and maintain the system,

4.1.1.1.8 Item managers who will buy replacements and spares for the weapon system,

4.1.1.1.9 Operations planners, analysts, and modelers who will plan and study the best ways to employ the system, and

4.1.1.1.10 Authors and subject matter experts who will write technical and operations manuals for the weapon system.

4.1.1.2 *Example Uses*. Through ACMS, authorized members of an IPT who create engineering data will be able to save data in secure storage areas with controlled access, promote data through various release levels, baseline product structures and data, and configuration control the data. Other authorized IPT members who do not create the engineering data, but use it will be able to find and retrieve engineering data they require; receive task notifications and accompanying engineering data via workflows and messaging capabilities contained within ACMS; view, comment on, and mark-up or redline engineering data using viewing tools provided by ACMS; and participate in design and engineering change evaluations even though the individual members of the IPT are geographically and organizationally dispersed. Members of the IPT will have concurrent access to the engineering and technical data, although ACMS will preclude multiple users from being able to simultaneously change (revision) the data. Note that in the context of ACMS, controlled data will never be changed, but it may be revisioned.

4.1.2 Manufacture. By making design data accessible as it evolves, ACMS will enable the manufacturing community to be aware of and more readily influence the design of a weapon system. Additionally, during weapons system manufacture, ACMS will enable authorized members of the manufacturing community to rapidly find and retrieve design, manufacture, test, and analysis data that affect the development of manufacturing processes, the acquisition or configuration of manufacturing equipment, and the procurement of materials. This will facilitate early planning and the evaluation of manufacturing alternatives. For example, manufacturing simulations can be prepared early on based on evolving engineering data. These simulations may reveal design problems from a manufacturer's perspective, but also will enable the manufacture to begin planning the production process sooner. Additionally, members of the manufacturing community will be able to initiate change proposals or participate in their evaluation using ACMS' engineering change forms, workflows, and viewing and mark-up capabilities. ACMS will provide them with access to supporting engineering data, thus enhancing the quality ECPs. ACMS also will enable a preparer of an ECP to determine if similar or related ECPs are in process, have been rejected, or have been approved.

4.1.3 Operation. ACMS will provide authorized operational users of the weapons system with rapid access to data they need to more efficiently plan the system's use, operate the system, and employ the system. For example, operations analysts might use physical attributes of the system as input into an operational simulation. The simulation would indicate how well the system performed in a specified scenario. In another example, force planners might use design and engineering data to determine interoperability between systems. In yet another example, deployment planners might use engineering data to determine or simulate transportation requirements for the weapon system. Additionally, survivability analysts could access design data that provides inputs to survivability models for predicting weapon system survivability against certain threats in certain scenarios. Like members of the manufacturing and other communities, authorized operational users will be able to initiate change proposals or participate in their evaluation using ACMS' engineering change forms, workflows, and viewing and mark-up capabilities. ACMS will provide them with access to supporting engineering data, thus enhancing the quality of ECPs. ACMS also will enable a preparer of an ECP to determine if similar or related ECPs are in process, have been rejected, or have been approved.

4.1.4 Sustainment. Both logisticians and maintenance personnel will benefit from ACMS' ability to provide them with access to needed engineering and analytical data. Logisticians could use the design or

analytical data to help them predict replacement and spares rates. Maintenance workers could access ACMS when servicing equipment in the field when a particularly unusual or difficult maintenance event occurs. A field maintenance worker also could use ACMS' remote access capabilities via a web browser to initiate an ECP to initiate a correction to a problem only discovered in the field. An example would be a design that makes it impossible to remove a component after item manufacture. Both logisticians and maintenance personnel will be able to initiate change proposals or participate in their evaluation using ACMS' engineering change forms, workflows, and viewing and mark-up capabilities. ACMS will provide them with access to supporting engineering data, thus enhancing the quality of ECPs. ACMS also will enable a preparer of an ECP to determine if similar or related ECPs are in process, have been rejected, or have been approved.

4.1.5 Disposal. Disposing, recycling, or salvaging retired weapon systems can benefit for ready access to engineering and technical data via ACMS. With ACMS the individuals responsible for the disposal of a system will be able to better plan through access to data on the various configurations that have been fielded. They also will be able to identify hazardous or precious materials that may be included in the system. If desired, the technical data could include handling instructions for these materials. Like the other communities involved in the life-cycle of a weapon systems, the disposal community will be able to develop, receive, and evaluate ECPs via ACMS.

4.2 ACMS Operation within Engineering Data Life-Cycle. The above discussion described ACMS' role in managing engineering and technical data throughout a weapon system's life-cycle. Another perspective of data management needs to be considered when specifying the ACMS concept of operations. That is the perspective of engineering data's life-cycle -- from its acquisition or creation, through its management and use. The following paragraphs describe the role and support ACMS provides from the perspective of the data's life-cycle.

4.2.1 Data Acquisition

4.2.1.1 *Overview*. Engineering data acquisition involves the creation, revision, purchase, conversion, or any other method of obtaining new Army engineering data. The acquired data may be authored by the Army, developed for the Army (under contract), or purchased by the Army. Acquired data also includes new versions of existing data which often are considered to be modifications of old data (controlled data never changes). The acquired data may be physically retained by the Army or by a third party such as a contractor. The new data includes actual engineering data representations of products (e.g., drawings, models, and documents), product structure representations, configuration control data, ECPs, mark-ups and redlines, relationships between data, relationships between data and product structure elements, and other data about the engineering data (metadata). All are types of data captured and controlled by ACMS.

4.2.1.2 *Operational Concept*. ACMS will support the engineering data acquisition life-cycle phase primarily by providing the means to introduce acquired data into the ACMS environment of managed data. With a few exceptions, as described later in this paragraph, the actual authoring of engineering data is outside the domain of ACMS. For example, ACMS will support the introduction of acquired data into the Army's environment of managed data by providing the ability to capture and securely store authored data via its data vaulting capabilities. ACMS also will provide mechanisms for obtaining engineering data and metadata from contractors. These mechanisms will be based on standards such as the STEP, CALS, and MIL-STD-2549, along with an open and published API. In these cases the actual authoring of the data is done external to ACMS. On the other hand, ACMS will support the direct creation of some engineering data by providing data authors with the capability to build product structures, assign relationships between data items, and establish relationships between data items and product structure elements. Using system administrator configurable forms and automated rules, ACMS also will enable authors of data to initialize configuration control data such as assigning configuration item identifiers. In another example of data authors creating data using ACMS, they will be able to generate ECPs and record their evaluations of ECPs

by using ACMS forms and viewing/mark-up tools. The following subparagraphs provide descriptions of specific ACMS operational capabilities that will support the acquisition of Army engineering data.

4.2.1.2.1 *Secure Data Storage*. ACMS will provide for secure storage of acquired engineering data in accordance with defined access control permissions and rules. Secure storage is defined as the ability to preclude stored information from being viewed, reused, updated, or deleted in violation of ACMS access permissions and rules. Examples of the kinds of data ACMS will store and protect include product data files and/or documents (native or standard formats), metadata associated with managed product data, administrative data, references to data external to ACMS, records in an associated database, and electronic forms such as ECPs.

4.2.1.2.2 *Data Check-In*. Checking data into the ACMS is the means by which engineering data is entered into the ACMS environment of managed data. Upon initiation of the check-in function, ACMS will present, a data author with a form of required ACMS metadata. The metadata fields on the form will be empty or contain existing or default values (Default values are for new data that is being loaded for the first time. Existing values are for data that is being revisioned.). The user will enter, modify, or accept the metadata and proceed with the check-in operation. ACMS will then move the data and metadata from the user's workspace into the ACMS vault to which the user is assigned. ACMS will notify the user as to the success of the transaction and make the core metadata available to all systems within the ACMS federation. The user will not need to know the actual physical location of the data. If the data had been checked out for revision, ACMS will release the check-out lock at this time.

4.2.1.2.3 *Populating JEDMICS*. Loading JEDMICS with acquired Army data is a special case for ACMS data check-in. Army data owners or authors will populate JEDMICS with engineering data by using ACMS check-in features. The data owner or author will login to his or her normal ACMS host. ACMS will present required ACMS metadata with default values to the user who will modify or accept the metadata. From this metadata, ACMS will prepare the associated JEDMICS file index data. The user will then initiate the JEDMICS load procedure. ACMS will move the data from the user's workspace and transmit both the file index data and engineering data to JEDMICS. JEDMICS will store the engineering data received from ACMS and populate the JEDMICS file index with the necessary metadata provided by ACMS. JEDMICS will then send ACMS any file index data that JEDMICS produces or revises (e.g., file location) back to ACMS. ACMS will then update its own metadata to keep the systems synchronized. If necessary, JEDMICS will send ACMS notices that indicate whether or not the transaction was successful. ACMS will present the notices to the user for his or her action if necessary. Using ACMS to load JEDMICS with new Army engineering data will preserve the integrity of ACMS metadata and ensure ACMS and JEDMICS are synchronized.

4.2.1.2.4 *Translate Files*. In the future, ACMS will include a set of file translators that produce STEP and CALS compliant formats. In support of user requests for data, ACMS will schedule and route files to appropriate file translators, apply default settings for translations, initiate the translation, and route the output file to the user.

4.2.1.2.5 *Build Product Structures*. The creation of product structures is a form of engineering data authoring. ACMS will provide for the creation of new product structure elements such as assemblies, components, and parts. These parts may then be associated (i.e., related or linked) in a hierarchical manner to represent a newly defined item. ACMS will present the hierarchical product structures to users via a graphical display. Product structures may be revised and retained as new versions. ACMS will provide for the establishing, recording, and maintaining multiple versions for a given part, component, or assembly. ACMS also will provide the ability to specify and maintain product structure effectivity information on when a part version is valid for use in assembling a particular version of a product.

4.2.1.2.6 *Establish Relationships*. In addition to the product structure relationships described above,

ACMS will be the authoring tool for defining the following kinds of relationship data: links between engineering data and product structure elements, links between two data items, and the type of links themselves. The links between engineering data and product structure elements are the means by which engineering is associated with particular product structure elements. These are the links that will enable ACMS users to find engineering data by navigating product structures. The links between data items are the means by which two pieces of engineering data are related to one another. The nature of the relationship is defined by the type of link. The type of data link itself can be created and defined, thus allowing data authors to establish new ways of describing the relationships between data items.

4.2.1.2.7 *Create ECPs*. A change initiator will login to ACMS for the purpose of building an ECP. Once into ACMS, the change initiator will request a standard ECP form. ACMS will present the form, which may have been tailored by the local system administrator, to the change initiator who inspects the default data provided by ACMS and makes changes and adds data as necessary. ACMS will automatically assign the next available unique ECP number. The change initiator will use ACMS' query/search and/or product structure navigation capabilities to find any engineering data that needs to be attached to the ECP form and submit the ECP for consideration via a predefined ECP workflow.

4.2.1.2.8 *Redline Images* . Redlined or marked up viewable images are another kind of data that is acquired using ACMS. ACMS will provide the ability for multiple reviewers to create red-lines, mark-ups, or annotations to viewable images. This reviewer created data will be controlled and maintained in conjunction with the viewable image. ACMS will ensure, however, that individual reviewer red-lines and annotations are kept distinct.

4.2.1.2.9 *Web-Based Access*. Web-based access to the ACMS is relevant to the data acquisition life-cycle phase because data authors with access to a web browser will be able to use a browser to check data into ACMS using the browser and the Internet.

4.2.1.2.10 *Acquire Metadata*. Metadata will be acquired via ACMS from both data authors and external data management systems. When checking in data, ACMS will present the author or owner with a predefined form to be completed. Where default values exist, ACMS will populate the form with those defaults for the author to modify or accept. ACMS will store and control access to the metadata for future use. Metadata will also be obtained by ACMS from external data management systems. At a minimum, ACMS will be capable of importing MIL-STD-2549 data elements for external systems.

4.2.2 Data Management

4.2.2.1 *Overview*. In the data management phase of engineering data's life-cycle, the main objective is to control the data in such a way that the data is protected without unnecessarily burdening the authors of the data while also facilitating the ease in which authorized users of the data are able to find, retrieve, and work with the data. The main activities under data management include storing data, protecting data by controlling access while making it easily accessible to authorized users, configuration managing data, distributing data in response to authorized requests, archiving and backing up data, and recording the status of data and changes in that status.

4.2.2.2 *Operational Concept*. Within the Army's concept for engineering data management, ACMS will be the Army's corporate engineering data management system with visibility into and configuration control of all official engineering and technical data. As a federation of systems at the individual commands, however, ACMS will share control of the data with the individual systems. This means that while the local component of ACMS will exercise physical control over the data, any ACMS user will be able to find and retrieve any data maintained within the ACMS federation. The notion of shared data control is further extended when ACMS exchanges metadata with external PDM, CM, or CITIS systems. This exchange will provide ACMS with visibility into what data is available and where it is located. As the Army's

primary mechanism for accessing the data, ACMS will interact with the external systems to request the data be provided when needed. The following subparagraphs provide descriptions of specific ACMS operational capabilities that will support the management of Army engineering data.

4.2.2.2.1 *Store and Protect Data*. ACMS will provide a data vaulting capability for the storage of engineering data that is not kept in repository systems such as JEDMICS. The ACMS vault will not only securely store traditional engineering data such as drawings, models, and documents, but it also will store and protect viewable images, redlines and mark-ups of viewable images, metadata associated with managed engineering data, administrative data, references to data external to ACMS, records in an associated database, and electronic forms such as ECPs. ACMS will protect the data by restricting access to the data in accordance with defined access control permissions and rules. ACMS will have the ability to vault data under its control in distributed vaults. ACMS will protect Army data stored in JEDMICS by serving as the Army's single entry point into JEDMICS for the purposes of both loading and retrieving data.

4.2.2.2.2 *Locate Data*. Users of ACMS will be able to locate and retrieve any data managed under the ACMS federation of systems. An Army data user will find engineering data by either using search queries against metadata or via product structure navigation. It will not be necessary for the user to know the specific location of the data in the ACMS federation. The user will be prevented from searching on metadata for which he or she is not authorized to see. Similarly, the user will precluded from navigating product structures for which he or she is not authorized to view.

4.2.2.2.3 *Control Access to Data*. Access control is the mechanism by which ACMS protects the integrity of engineering data and guards it from unauthorized identification and retrieval. ACMS will manage and monitor authorizations and restrictions to data. It also will protect the integrity of the data through check-in and check-out functions.

4.2.2.2.3.1 *(Authorizations and Restrictions)* -- ACMS will provide for checking the identity and authorizations of users and restrict their ability to see metadata, navigate product structures, and retrieve data as defined by access control permissions and rules. These permissions and rules will enable system administrators to restrict access to ACMS by type of information, the status of the data (release level or specific baseline), data sensitivities and distribution limitations, and the roles assigned to a user or group. ACMS access rules will define the types of access allowed to users, groups, or roles (create, read, use, or delete). Attempts to access ACMS data will be monitored and users whose unsuccessful attempts exceed a system administrator specified maximum threshold will be exited from the system and the unauthorized attempts to access data will be recorded.

4.2.2.2.3.2 *(Data Check-In and Populating JEDMICS)* -- Data check-in is an operation that supports both the data acquisition and data management life-cycle phases. It is the means by which new or revised data is brought under ACMS' control, hence the association with data acquisition. It also is a means of managing the integrity of controlled data, hence the association with data management. A discussion of data check-in is included in the data acquisition section and is not repeated here. Populating JEDMICS is a special case of data check-in. It also is discussed in the data acquisition section.

4.2.2.2.3.3 *(Data Check-Out)* -- Once the desired data is found, either as the result of a successful search or through product structure navigation, the user will initiate the ACMS check-out function. If the user is authorized to access the data, ACMS will respond by moving the requested files or information (e.g., database records) from the ACMS vault to the user's workspace. Upon check-out, ACMS will lock the requested files to prevent multiple users from attempting to modify the data simultaneously. Other users will be allowed to view and copy the checked out data (the copy would be treated as new data), but they would not be able to modify it or create new versions until the check-out is released. ACMS will update the metadata to show who has the data checked out and will provide the ability to view which user has checked the data out from the vault. If the user who has checked the data out decides he or she no longer

intends to modify the data and only wants to view the data or work with a copy, then he or she may release the lock if so desired, thus freeing the check-out for other users.

4.2.2.2.3.4 *(Retrieve JEDMICS Data)* -- Army data users will check engineering data out of JEDMICS via ACMS. The data user will login to his or her normal ACMS host. An ACMS user will find desired data using search queries or product structure navigation. The user will initiate the ACMS check-out function and ACMS will prepare and transmit request for the data to JEDMICS. ACMS will receive the data from JEDMICS and present it to the user. If necessary, JEDMICS will send ACMS notices that indicate whether or not the transaction was successful. By using ACMS to retrieve JEDMICS data, it will be possible to manage use of Army engineering data, make sure that users are receiving the correct data, and facilitate concurrent engineering efforts. The same file locking and metadata update procedures described earlier in will apply for checking out JEDMICS data.

4.2.2.2.4 *Distribute Data*. ACMS will provide for the routing and transport of data in support of numerous operations and events. Specifically, ACMS will move data between a user's workspace and ACMS' data vault in response to check-in and check-out operations, pre-defined event triggers, or workflow prompts. ACMS also will support data exchanges with among the systems within the ACMS federation and with external repositories, PDM, configuration management, and CITIS systems. ACMS will record information about the data transport transaction. For example, ACMS should record the time, initiator, and recipient of the transaction.

4.2.2.2.5 *Exchange Data with External Data Management Systems*

4.2.2.2.5.1 *(Receiving Data)* -- ACMS will be responsible for providing visibility into and access to all Army engineering data. When Army data is controlled by and vaulted in data management systems external to the ACMS federation, ACMS will need to be capable of receiving both engineering data and data about this engineering data (metadata) from the external data management system. Examples of these external data management systems include PDM, CM, CITIS, or authoring systems. To accomplish this, ACMS will need to have a published API and will need to migrate towards the configuration management data interface standard (MIL-STD-2549) as the means for defining what metadata must be exchanged among ACMS and other PDM, CM, and CITIS systems. MIL-STD-2549, *Department of Defense Interface Standard, Configuration Management Data Interface*, defines the minimum core metadata which must be sharable within and outside the ACMS federation. The data elements describe the configuration management data needed to support the principles of configuration management specified in EIA/IS-649, *National Consensus Standard for Configuration Management*. These data elements and the relationships depicted in MIL-STD-2549 also provided the basis for exchanging rudimentary product structure information in the form of parts list and Bill of Materials (BOM) data. Once ACMS determines that the desired data is located in an external system and if the user requests the data, then ACMS will formulate a request for the engineering data, initiate a session with the system that controls and stores the data, submit the request, receive the requested data or appropriate response notice, and present the results (data or response notice) to the ACMS user. As a result, Army data users will be able to check-out Army engineering data via ACMS even when ACMS does not directly manage the data.

4.2.2.2.5.2 *(Providing Data)* -- ACMS also needs to be capable of providing engineering data and metadata to external systems when the Army provides engineering data to contractors or other government entities. As a result, ACMS will be capable of exporting MIL-STD-2549 data elements for external systems.

4.2.2.2.5.3 *(Synchronization with External Data Management Systems)* -- In some instances, ACMS will need to be kept synchronized with an external data management system. Depending on the level integration between ACMS and the external data management system, this synchronization will either be done automatically or procedurally. The approach will be determined during implementation. An example

of a procedural approach to synchronization between ACMS and an external data management system is when the owner or author of the data assumes responsibility for logging into ACMS and updating ACMS as to the state of the controlled data. Automatic synchronization can occur several ways. One approach involves integrating ACMS into the external data management system, so that access to and control of the data is through ACMS. Other methods of automatic synchronization include pushing metadata about changes to the engineering data from the external data management system to ACMS on a regular basis. Another approach involves ACMS pulling the state change metadata from the external data management system by polling system at regular intervals. A third approach to automatic synchronization involves retrieving the metadata from the external data management system on a "when needed" basis and comparing the retrieved metadata with ACMS' metadata to determine if changes have occurred.

4.2.2.2.6 *Workflow Capabilities*. ACMS will include the ability to distribute tasks and data via workflow capabilities. Specifically, ACMS will provide users the ability to build, participate, and monitor pre-defined and ad hoc workflows. ACMS will permit users to build, participate, and monitor ACMS workflows using a web browser across the Internet or via a regular ACMS client application.

4.2.2.2.6.1 *(Workflow Builders)* -- Certain ACMS users will be able to build workflows. These workflows may be saved as templates or executed as ad hoc workflows. The creator of a workflow will be able to build sequential and concurrent tasks, establish timed and event triggers, and assign roles to users with specific data access rights for specific tasks within the workflow (may temporarily restrict or expand a user's rights when the task becomes active).

4.2.2.2.6.2 *(Workflow Participants)* -- A participant in a workflow will receive notifications of workflow tasks. ACMS will enable participants to check their work queues, select a specific task on which to work, read any task messages or notifications that accompany the task, retrieve data that has been associated with the task, and electronically sign-off on task completion or data.

4.2.2.2.6.3 *(Workflow Monitors)* -- Selected ACMS users will be able to monitor the progress of tasks within the workflow. This includes being able to determine which tasks have been completed, which tasks are late, and the workloads of individuals participating in the workflow. Again this function may be performed either via a web browser or the ACMS client application.

4.2.2.2.7 *Configuration Manage Product Structures and Engineering Data*. ACMS will configuration manage product structures and engineering data in accordance with the guidance provided in MIL-HDBK-61, *Configuration Management Guidance*, and MIL-STD-2549, *Configuration Management Data Interface*. Specifically, ACMS will enable users to record the following: 1) the unique identifiers for configuration items (CIs) and their subordinate parts and assemblies , 2) the identifier of each CI's configuration control authority, 3) the unique identifier of configuration baseline engineering data, 4) the release and baseline status of any ACMS controlled product structure or data item, 5) the correlation between engineering data and the product item it represents, 6) the unique file identifiers (to include version number or time/date stamp), 7) the part numbers corresponding to CIs and subordinate parts and assemblies, 8) the effectivity and release times and dates for product structures and data, 9) the identifiers and status of ECPs and requests for deviations (RFDs), 10) the results of configuration audits, and 11) ECP and audit actions assigned to individuals.

4.2.2.2.8 *Record and Report on Data Status*. ACMS will record and present to authorized users the release, baseline, change, and audit status of product structures and engineering data. In particular, ACMS will provide authorized users with the capability to record the release levels of specific product structures and engineering data, when the product structure or data was promoted to the indicated release level, and when the release became effective. Authorized users will be provided the ability to generate displays and reports containing the above release status data. ACMS also will enable authorized users to record the identity of a baselined product structure and related configuration data, along with when the baseline was approved and the effective date of the baseline. ACMS will also record and report on the status of

engineering changes, actions associated with the changes, and the implementation status of changes. As audits are performed, ACMS will record and report on the schedules, status, and results of configuration audits.

4.2.2.2.9 *Archive and Backup Data*. ACMS will provide system administrators with the tools necessary to establish and maintain archives and backups of data kept in ACMS vaults. In the event of corruption or other damage to the ACMS data vault, ACMS will enable system administrators to restore the system from backups. Similarly, ACMS will provide system administrators with the tools needed to request and retrieve historical archives information from off-line archival storage.

4.2.3 Data Use

4.2.3.1 *Overview*. Use of data within engineering data's life-cycle involves all activities which require a direct interface with a consumer of the data, as opposed to an author or manager of data. Example activities performed by consumers include finding, requesting, receiving, viewing, analyzing, processing or manipulating, and printing data. Sometimes copying and redlining data are considered activities within the data use life-cycle phase, but for the purposes of this discussion, they are part of the data acquisition (creation) phase (discussed earlier).

4.2.3.2 *Operational Concept*. ACMS is a data management system. Its support of the data use life-cycle phase is limited to assisting consumers of data in finding, requesting, receiving, viewing, and printing data. There are two categories of ACMS data consumers: individuals and applications. Individuals typically will interact with ACMS via ACMS client software or across the Internet using a web-based browser. Individual consumers will find data by navigating product structures to locate relevant data or searching for classes of products or data via queries against metadata contained in ACMS. Once data is located, the individual consumer will initiate a request for the data which ACMS will retrieve and present to the consumer. After receiving the data, the consumer will use ACMS or local viewing tools to view the data and, if desired, print the image. Applications which are consumers of Army engineering data will interact with ACMS by an open and published interface. The interface may involve exchanging engineering data or metadata, or it may involve the application invoking an ACMS feature. The following subparagraphs provide descriptions of specific ACMS operational capabilities that will support the management of Army engineering data.

4.2.3.2.1 *Navigate Product Structures*. Users of ACMS will be able to locate and request data managed under the ACMS federation of systems by navigating product structures. The user will only be able to navigate product structures for which he or she is authorized to view. Product structures may be navigated via ACMS' web-based browser capability or via ACMS client software. It will not be necessary for the user to know the specific location of the data in the ACMS federation.

4.2.3.2.2 *Search Data Attributes*. ACMS users also will be able to search for engineering data by constructing queries against product data attributes. ACMS will provide the ability to classify data by groups which share a common set of required attributes. Once a user determines which class of data they need, it will be possible for the user to build queries to locate particular instances of the class. The queries, which may be saved for later reuse, will provide the ability to search attributes associated with the particular classification for specific values, ranges of values, and logical combinations using Boolean operations. Because the system administrator will have the ability to restrict user's access to specific product data attributes, ACMS will also be able to restrict the types of queries users can create. Data searches via queries may be created and initiated from ACMS' web-based browser capability or from the ACMS client software. As before, it not be necessary for the user to know the specific location of the data in the ACMS federation.

4.2.3.2.3 *Request and Retrieve Data*. Once data has been found within ACMS, either as the result of a

successful search, through product structure navigation, or association with a workflow task, the user will initiate the ACMS check-out function. If the user is authorized to access the data, ACMS will respond by moving the requested files or information (e.g., database records) from the ACMS vault to the user's workspace. ACMS will perform this operation regardless of whether the user has accessed ACMS via a web browser or via an ACMS client application. In some cases, the request for data includes launching a viewing or authoring application. If the requested file requires translation prior to presentation to the user and an appropriate translator has been included as part of ACMS, then the request and receipt of the data will trigger an automatic translation of the data for the user.

4.2.3.2.4 *View Images*. ACMS will provide a number of imaging services that enable a user to view and redline images. ACMS will provide for the launching of viewing and redlining software applications via file associations. When a file is checked out using ACMS and the file type is of a particular type, ACMS will launch the appropriate software to either view, redline, or, in some cases, first translate the file to a form that can be viewed or marked up. ACMS will control and protect the viewable and redlined images. ACMS also will ensure that individual reviewer redlines and annotations are kept distinct.

4.2.3.2.5 *Print Data*. As part of its support to the data use life-cycle phase, ACMS will provide users with the ability to print viewable images and redlines.

5. ACMS Support to Selected Business Processes

5.1 Introduction. The following paragraphs present examples of ACMS operational capabilities being applied in support of three business processes. This is done to tie the various operational capabilities described in paragraph 4 and illustrate their use in Army processes that require engineering and technical data. The three processes presented are Integrated Process Team (IPT) Information Sharing, Engineering Change Proposal (ECP) Processing, and Technical Data Package (TDP) Validation.

5.2 IPT Information Sharing. During system development, ACMS will provide authorized IPT members simultaneous access to current, relevant engineering data. IPT members are apt to be geographically dispersed and represent a variety of communities, each having different life-cycle responsibilities for the system. As such, they will work with the data in different ways. All will require the ability to rapidly identify data they need and to retrieve that data in a form in which they can use the data.

5.2.1 Data Creation. Creators of data on an IPT will use ACMS to create working and released data. Both types of data will be vaulted in a secure environment where access to the data is strictly controlled via user, group, and file type permissions.

5.2.1.1 *Working Data*. Working data represents work in-progress. Only data creators may make changes to the data, but select members of the IPT may be given view or copy access to the data. In the early stages of its life, working data may be non-versioned. In this circumstance, the state of the data is highly dynamic, but still stored in a secure, non-versioned vault where other members of the design team and possible members of the IPT can access the data. Data creators are trusted to coordinate changes they make, but are not required to establish new versions until the data reaches an appropriate level of maturity. When a change is being made, the non-versioned data is checked out from ACMS. This locks the data from changes by others, but does not preclude other users from copying or viewing the data. When the data is checked back in, the data is released for check-out by others, but is not versioned. As the data matures, the design team may elect to move their working data into a versioned vault. Once this happens, each time the data is check-out, revised, and then checked back in to the vault, a new version is created. Eventually, as the data matures further, it will become time to formally release the data for access to a wider audience. ACMS will enable the current data change authority to have a workflow created for release review (or retrieve a saved workflow). The candidate release data will be figuratively routed through the workflow

along with an electronic release review form where comments and electronic sign-offs can be captured. Reviewers will retrieve the data using ACMS, mark-up or redline a viewable image, add comments to the review form, and either recommend the data be reworked or add their electronic signatures to the sign-off. When the data successfully progresses through the review, the data will transition from working data to released data and will be subject to formal configuration control rules and processes.

5.2.1.2 *Released Data*. Released data represents data that is under formal configuration control. It may not be changed, but new versions can be created via a formal engineering change process (described later). Released developmental data, delivered data, and baselined data can fall into this category of data. Like working data, released data is vaulted and subject to access control rules. New versions of released data may be created, but it does not constitute a new release until after an engineering change proposal successfully passes through the formal engineering change process. A trusted data creator then checks out the current version of the released data, makes changes using an authoring application, and then saves (checks in) the revised data as a new version and a new release. Changes to baselined releases of data is supported in a similar manner. The difference is that the change control process must go through a Configuration Control Board (CCB) prior to accepting the change and, both the release status attribute and the baseline status attributes of the data will change

5.2.2 Concurrent Access to Data A key assumption in the use of IPTs is that members will have simultaneous access to current, relevant engineering data. Sometimes this required data will be working data. In other cases, the data will be released and possibly baselined data. In either case, ACMS will make the data available to authorized IPT members. It also is desired that their access to the data be based on their responsibilities and roles, not where they are geographically or organizationally.

5.2.3 IPT Member Access to Data. ACMS will allow members of an IPT to login to ACMS via ACMS client software or a commercial web browser. Based on the member's rights as determined at login, ACMS will control the member's access to metadata and the actual engineering data. The IPT member will be able to search or navigate ACMS for engineering data or metadata about a particular part, component, or product. Searches will be possible via query or search forms. These queries or searches will be performed against attributes of the engineering data contained in the set of metadata. The actual forms will be customizable by the ACMS system administrator. ACMS also will enable the IPT member to find data by navigating product structures. Once desired engineering data is found, the IPT member will be able to request either a display of metadata, a viewable image of the engineering data, or the source data (e.g., CAD model). If the data is checked out by someone else, ACMS will retrieve a copy of the requested data. If the data is available for check-out and the IPT member has check-out permissions, ACMS will check the data out and present it to the IPT member. In some instances, ACMS will actually provide the tool necessary to view or translate data. In other instances, ACMS will launch a viewing or authoring application for the member. Displays of metadata will be customizable by an ACMS system administrator.

5.2.4 Data Use as Part of a Workflow. Many IPT members will be users who do not create data, but review, evaluate, or reference engineering data on an regular basis. This can be done as part of a specific task for which they are responsible, in preparation for a major milestone, or as part of a process such as obtaining approvals to release engineering data. In some of these cases, the IPT members will need to find, retrieve, and view data just to understand the current state of the requirements, design, or manufacture. In other cases, they will be an active participant in a pre-defined or ad hoc workflow where they need to review data purposes as part of an assigned task. The following paragraphs describe IPT use of ACMS in a workflow situation.

5.2.4.1 *Workflow Builder*. Certain members of an IPT will be able to build ACMS workflows. These workflows can be saved as templates or executed as ad hoc workflows. IPT members who build workflows will be able to build sequential and concurrent tasks, establish timed and event triggers, and assign users to roles with specific data access rights for specific tasks within the workflow. Workflows may be built so

that the rights of specific users or the rights associated with specific roles are temporarily restricted or expanded once the task becomes active.

5.2.4.2 *Workflow Participant*. As a participant in a workflow, an IPT member receives notifications of workflow tasks. ACMS will enable IPT members to check their work queues, select a specific task on which to work, read any tasking messages or notifications that accompany the tasking, retrieve data that has been figuratively attached to the tasking, and electronically sign-off on tasks or data.

5.2.4.3 *Workflow Monitor*. Selected IPT members will be able to use the web browser to monitor the progress of tasks within the workflow. This includes being able to determine which tasks have been completed, which tasks are late, and the workloads of individuals participating in the workflow.

5.3 ECP Processing. ACMS will support engineering change proposal (ECP) processing using workflow management capabilities, predefined forms, linking of change data to ECP documents, and voting and electronic sign-off capabilities. ACMS where-used product structure management capabilities and product to data associations also will enable ACMS to facilitate change impact analyses. ECP processing involves creating an ECP, routing the ECP and attached documents to participants in the ECP evaluation process, performing change evaluations, capturing comments and mark-ups, approving proposed changes (voting and electronic sign-off), and initiating change implementation actions (work orders and instructions).

5.3.1 Creating an ECP. A change initiator logs in to ACMS for the purpose of building an ECP. The change initiator requests a standard ECP form from ACMS. ACMS presents the form to the change initiator who inspects the default data provided by ACMS and makes changes and adds data as necessary. ACMS will automatically assign the next available unique ECP number. The change initiator uses ACMS' query/search and product structure navigation capabilities to find any engineering data that need to be figuratively attached to the ECP form. The ECP form may be customized by the local system administrator.

5.3.2 Creating an ECP Workflow. Depending on the ECP and local operational procedures and preferences, ECPs can be distributed via ACMS' predefined or ad hoc workflows. ECP workflows can be built from sequential and concurrent tasks, can have timed and event triggers, and can assign users to roles with specific data access rights for specific tasks within the workflow (may temporarily restrict or expand a user's rights when the task becomes active).

5.3.3 Distributing an ECP and Attached Documents. A change initiator submits an ECP form and attachments for distribution to change evaluators. Depending on command preferences, there are several options for initiating the distribution of an ECP. One option is to send the ECP and attachments to a change administrator who is then responsible for further distribution of the ECP (e.g., invoking an appropriate workflow). A related option is to establish a "drop box" location in ACMS for candidate ECPs. The change administrator would periodically checked the "drop box" and distribute new ECPs. A third option is to configure or customize ACMS to automatically route a new ECP in accordance with a predefined workflow, once the ECP is submitted by a change initiator. In this case, a new ECP triggers an automatic process within ACMS. Regardless of the option for initiating a distribution, participants in the workflow will be assigned, their roles established (which in turn establishes their access rights), and ECPs will be routed based on predefined or ad hoc workflows.

5.3.4 Performing Change Evaluations. Participants in an ECP workflow will be notified by e-mail of tasks. ACMS will provide workflow participants with a means to identify outstanding workflow tasks. Participants will select tasks on which to work and use ACMS to retrieve data necessary to conduct the ECP evaluation. Data attached to the ECP will be retrieved directly from ACMS' representation of the task. Any other technical or engineering data that the evaluator deems necessary will be located and retrieved using ACMS' query/search, product structure navigation, and check-out capabilities.

Additionally, evaluators will use ACMS' where-used capabilities and multiple views of product structures to facilitate the conduct of impact analyses. For example, a manufacturing view of the product structure will help identify manufacturing process data that may be impacted by a proposed change. Likewise, a testing view of the product structure might reveal the need to change test plans. The ACMS ECP form will include the capability to attach evaluator comments and recommendations. In some cases, evaluators will use the mark-up or redline features of ACMS on viewable images to indicate concerns or recommendations. In other cases, an evaluator may retrieve a copy of data from ACMS and use an authoring application to create an alternative to the proposed change. This would be saved as new data, separately controlled, but attachable to the workflow. Upon completion of the evaluation, an evaluator will electronically indicate task completion using ACMS. This will trigger ACMS to move the ECP on through the workflow.

5.3.5 Approving Proposed Changes (Voting and Electronic Sign-Off). At some point in the ECP workflow, members of the Configuration Control Board (CCB) will be tasked to vote on the acceptability of the ECP. ACMS will provide the ability to record these votes and protect against unauthorized or premature voting. ACMS also will tabulate the votes and present them to the individual responsible for formally approving the ECP. ACMS will record the electronic sign-off or rejection of the ECP.

5.3.6 Initiating Change Implementation Actions. As a result of a decision to make a change, it is necessary to initiate a series of change implementation actions. Depending on individual command preferences and policies, the change implementation actions can be initiated and managed via ACMS workflow capabilities. A change implementation workflow would start with a CCB directive which orders that the change be made. This directive would be submitted to an ACMS workflow with relevant contract, program management, and financial data as attachments. Contracts personnel will be tasked to negotiate contract modifications. Program managers or task leaders will then be tasked via the workflow to develop change instructions which in turn will be routed to engineers via the ACMS workflow capabilities. Engineers will design the directed changes using data checked out from ACMS. The engineers will create new versions of the data, but that data will not be released as the new, baselined version of the product until after it has gone through a release review. The release review also will be supported by an ACMS workflow. Upon approval of data's release (captured electronically in ACMS), a "trusted user" will promote the appropriate version of the data to be the new baseline for the product. The "trusted user" also will enter effectivity information relevant to the new, baselined version of the product data. ACMS will maintain a audit trail of changes. ACMS also will disseminate change notifications to individuals previously identified as needing to know about changes to a product's data.

5.4 TDP Validation. ACMS will support validation of Technical Data Packages (TDPs) by automatically responding to reprocurement event triggers, assembling a technical data package list (TDPL), presenting links to the data referenced by the TDPL, and then initiating an appropriate TDP review workflow that culminates in approval and certification of the TDP via electronic sign-off. This process starts with the identification of a need for a part by procurement (Inventory Management). A Procurement Work Directive (PWD) and a Procurement Request Order Number (PRON) are generated by the Inventory Manager's system in response to the need to procure a replacement or spares. The process ends when the certified TDP is sent to procurement.

5.4.1 Initiate Validation. An Inventory Manager, or an automated system supporting Inventory Management, will determine a need to procure replacements or spares. This will result in creation of a PWD and a unique PRON which is sent to the Configuration Manager. If the PRON and PWD were automatically generated and sent to ACMS, then ACMS will automatically respond to this event trigger by searching for the appropriate part, automatically assembling a TDPL, and automatically initiating a TDP review workflow. In the event that the PRON and PWD are not received automatically, then the Configuration Manager will need to login to ACMS, find the part via search queries or product structure navigation, and initiate the assembly of the TDPL and links to the associated engineering data that makes up the TDP. Once the TDPL has been generated and the associated engineering data linked, the

Configuration Manager will initiate an appropriate workflow for review, validation, approval, and certification of the TDP.

5.4.2 Retrieve Supporting Technical Data. Upon notification of an outstanding task, the TDP reviewers will be provided with a means to identify outstanding workflow tasks. The reviewers will select a task on which to work and use ACMS to retrieve the data associated with the TDP. Data attached to the workflow task will be retrieved directly from ACMS' representation of the task. Any other technical or engineering data that the reviewer deems necessary will be located and retrieved using ACMS' query/search, product structure navigation, and check-out capabilities. For example, the result of the query will identify product data by its drawing, document, or other product data identifier. This data will include engineering drawings, models, simulations, specifications, standards, testing requirements, quality requirements required to manufacture an item, associated lists; process descriptions; and outstanding Notices of Revisions (NORs). Other examples of data include documents defining physical geometry, material composition, performance characteristics, manufacture, assembly, and acceptance test procedures.

5.4.3 Review and Update TDP. ACMS will enable TDP reviewers to view and mark-up or redline viewable images of the technical data. Where the TDP is incomplete or requires modification, ACMS will enable the Configuration Manager to create, store, and control new data or make revisions to the existing data. Often, either of these activities will involve participating in an engineering data review or an ECP workflow prior to releasing the data.

5.4.4 Assemble and Certify TDP. As part of the TDP validation workflow within ACMS, the Configuration Manager will be able to retrieve a TDP Certification Form. The Configuration Manager will fill-in the TDP Certification Form and electronically sign-off on the certification. Once the task is completed, ACMS will route the certification and validated TDP to the Inventory Manager, completing the TDP validation workflow.